What is claimed is:

1. Optical amplifier equipment that amplifies optical data signals in a fiber-optic communications link that has at least one span of transmission fiber for carrying the optical data signals, comprising:

a Raman pump that produces Raman pump light that creates Raman gain for the optical data signals in the span of transmission fiber;

at least one optical monitor that measures backscattered Raman pump light from the span of transmission fiber; and

a control unit that uses the Raman pump and the optical monitor to perform optical time domain reflectometry measurements on the transmission fiber.

2. The optical amplifier equipment defined in claim 1 wherein the Raman pump comprises a plurality of laser diodes operating at different pump wavelengths.

3. The optical amplifier equipment defined in claim 1 wherein the control unit is configured to modulate the Raman pump light to produce a series of pulses having pulse widths in the range of 1-200 ns.

4. The optical amplifier equipment defined in claim 1 wherein the Raman pump produces Raman pump light at first and second wavelengths and wherein the control unit is configured to modulate the Raman pump light at the second wavelength to produce a series of pulses and is configured to modulate the Raman pump light at the first wavelength to produce changes in the Raman gain of the span while the series of pulses are used in performing optical

time domain reflectometry measurements on the transmission fiber.

5. The optical amplifier equipment defined in claim 1 wherein the control unit is configured to use the Raman pump and optical monitor to gather information on the Raman gain coefficient of the transmission fiber.

6. The optical amplifier equipment defined in claim 1 wherein the control unit is configured to control the operation of pumps for an erbium-doped fiber coil.

7. The optical amplifier equipment defined in claim 1 further comprising a wavelength-division-multiplexing coupler that separates the backscattered Raman pump light from the optical data signals being amplified on the span.

8. The optical amplifier equipment defined in claim 1 further comprising a wavelength-division-multiplexing coupler that is coupled to the span of transmission fiber and that separates the backscattered Raman pump light from the optical data signals being amplified on the span and that directs the Raman pump light into the span of transmission fiber.

9. The optical amplifier equipment defined in claim 1 further comprising:

a circulator that directs the Raman pump light into the span of transmission fiber; and

a wavelength-division-multiplexing coupler that is coupled to the fiber and that separates

backscattered Raman pump light from the optical data signals being amplified on the span and directs the separated backscattered Raman pump light to the monitor.

10. The optical amplifier equipment defined in claim 1 further comprising:

a wavelength-division-multiplexing coupler that is coupled to the fiber and that separates the backscattered Raman pump light from the optical data signals being amplified on the span; and

a circulator that directs the Raman pump light into the wavelength-division-multiplexing coupler, wherein the wavelength-division-multiplexing coupler directs the Raman pump light into the span of transmission fiber and wherein the circulator directs the backscattered Raman pump light from the wavelength-division-multiplexing coupler towards the optical monitor.

11. The optical amplifier equipment defined in claim 1 wherein the optical monitor comprises a first optical monitor that measures a first wavelength of the backscattered Raman pump light and wherein the optical amplifier equipment further comprises a second optical monitor that measures a second wavelength of the backscattered Raman pump light that is different than the first wavelength of backscattered Raman pump light.

12. The optical amplifier equipment defined in claim 1 wherein the optical monitor comprises a first optical monitor that measures a first wavelength of the backscattered Raman pump light, wherein the optical amplifier equipment further comprises a second optical

monitor that measures a second wavelength of the backscattered Raman pump light, and wherein the optical amplifier equipment further comprises a wavelength-division-multiplexing coupler that separates the backscattered Raman pump light by wavelength and directs the separated backscattered Raman pump light to the first and second optical monitors, respectively.

13. Optical amplifier equipment for amplifying optical data signals in a fiber-optic communications link that has at least one span of transmission fiber for carrying the optical data signals, comprising:

a Raman pump for producing Raman pump light to create Raman gain for the optical data signals in the span of transmission fiber, wherein the Raman pump light and the optical data signals propagate in opposite directions in the span of transmission fiber;

at least one optical monitor; and

a control unit that uses the Raman pump to provide modulated Raman pump light to the span of transmission fiber and the uses the optical monitor to measure corresponding backscattered Raman pump light from the span of transmission fiber.

14. The optical amplifier equipment defined in claim 13 wherein the control unit is configured to modulate the Raman pump light during a setup procedure in which the span of transmission fiber is being characterized.

15. The optical amplifier equipment defined in claim 13 wherein the control unit is configured to modulate the Raman pump light during use of the optical data signals

to carry normal data traffic on the span of transmission fiber.

16. The optical amplifier equipment defined in claim 13 wherein the Raman pump produces pump light at a first wavelength and a second wavelength and wherein the optical monitor comprises first and second optical monitors for measuring the backscattered Raman pump light from the span of transmission fiber at the first and second wavelengths, respectively.

17. The optical amplifier equipment defined in claim 13 wherein the Raman pump produces pump light at a first wavelength and a second wavelength and wherein the optical monitor comprises first and second optical monitors for measuring the backscattered Raman pump light from the span of transmission fiber at the first and second wavelengths, respectively and wherein the control unit modulates the first wavelength to produce a series of pulses that are each 1-500 ns in duration and that have a frequency of less than 5 kHz.

18. The optical amplifier equipment defined in claim 13 wherein the control unit is configured to use the Raman pump and optical monitor to perform optical time domain reflectometry measurements on the span of transmission fiber.

19. The optical amplifier equipment defined in claim 13 wherein the control unit is configured to use the Raman pump and optical monitor to locate fiber cuts in the span.

20. The optical amplifier equipment defined in claim 13 wherein the control unit is configured to use the Raman pump and optical monitor to determine which types of fiber are located in the span of transmission fiber.

21. The optical amplifier equipment defined in claim 13 wherein the control unit is configured to use the Raman pump and optical monitor to gather Raman gain coefficient information on the span of transmission fiber.

22. The optical amplifier equipment defined in claim 13 wherein the control unit is configured to use the Raman pump and optical monitor to determine when to reduce the power of the Raman pump to an eye safe level.

23. The optical amplifier equipment defined in claim 13 wherein the control unit is configured to provide information on the measured corresponding backscattered Raman pump light to a network management system.